PATENT ABSTRACTS OF JAPAN

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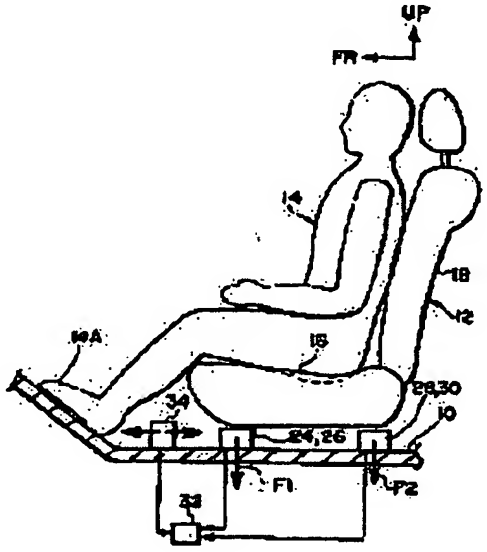
(54) OCCUPANT'S BODY WEIGHT DETECTING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To reduce the cost of parts, and to estimate the weight of an occupant's body with high accuracy.

SOLUTION: Between the position near the front end of a seat cushion frame and a floor 10, front side load sensors 24 and 26 to detect the seat load from a load applied to the front part of a seat 12 are provided. Between the position near the rear end of the seat cushion frame and the floor 10, rear side load sensors 28 and 30 to detect the seat load from a load applied to the rear part of the seat 12 are provided. The load sensors 24, 26, 28, and 30 are connected to a load estimating circuit 32, the load estimating circuit 32 calculates the gravity center of the load of the seat 12, depending on the loads F1 and F2 at the front side and the rear side detected by the load sensors 24, 26, 28, and 30, and the seat load is corrected depending on the calculated value, and at the same time, the weight of the occupant's body is estimated depending on the corrected load.



LEGAL STATUS

[Date of request for examination] 27.03.2000

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the crew weight detection equipment which is applied to crew weight detection equipment, especially is arranged by the sheet of an automobile.
[0002]
[Description of the Prior Art] Conventionally, the structure shown in JP,7-186880,A is known as an example of the crew weight detection equipment arranged by the sheet of an automobile.
[0003] As shown in drawing 10 , with this equipment, the weight sensor 102 is arranged in seat cushion 100A of a sheet 100, and the dip sensor 104 which detects the tilt angle of seat-back 100B is arranged in the connection section of seat cushion 100A and seat-back 100B. Although the detection value by the weight sensor 102 differs from the actual weight of the crew who sat down on the sheet 100, a control unit 106 detects the description which affects the difference of the detection value by the weight sensor 102, and actual crew's weight from the detecting signal from the dip sensor 104, and it asks for crew's actual weight from the function based on this detected description, and the function of detection weight.
[0004]
[Problem(s) to be Solved by the Invention] However, with this equipment, since the dip sensor 104 other than the weight sensor 102 was needed in order to detect crew's actual weight, there was nonconformity that components cost increased. In order to improve this, it is possible with the whole sheet, i.e., the both sides of a seat cushion and a seat back, to perform weight detection, but since the recess loads from crew's guide peg to a floor differ greatly depending on crew's taking-a-seat position, even if the whole sheet performs weight detection, the precision of a detection load gets worse and the nonconformity that dispersion in presumed weight becomes large as the result cannot be solved.
[0005] It is the object to obtain the crew weight detection equipment which this invention can reduce components cost in consideration of the above-mentioned data, and can presume crew's weight with a sufficient precision.
[0006]
[Means for Solving the Problem] A load detection means to detect each load applied before and after a sheet including the load which this invention according to claim 1 requires for a seat back, An amendment means to amend each load before and after computing the load center of gravity of a sheet based on each load before and after detecting with this load detection means and detecting with said load detection means based on the calculation value, It is characterized by having a crew weight presumption means to presume crew weight based on the amendment load amended with this amendment means.
[0007] Therefore, when crew sits down on a sheet, each load applied before and after a sheet including the load concerning a seat back is detected with a load detection means. Based on the amendment load which computed the load center of gravity of a sheet, amended each load of order with the amendment means based on that calculation value based on each load before and behind this, and was amended with the amendment means, crew weight is presumed with a crew weight presumption means. For this reason, the error of the presumed weight by change of a taking-a-seat position can be made small, and

crew's weight can be presumed with a sufficient precision.
[0008] The lever before rocking this invention according to claim 2 according to the load applied to the anterior part of a sheet including the load concerning a seat back, After rocking according to the load applied to the back of a sheet including the load concerning a seat back, a lever, A load detection means to detect the sum of the load doubled by said before lever by the predetermined rate of redoubling, and the load doubled by said after lever by the predetermined rate of redoubling, the rate of load redoubling according the rate of load redoubling by the preparation and said before lever to said after lever -- comparing -- the rate of predetermined -- it is characterized by setting up greatly.
[0009] Therefore, although a large load escapes from crew's guide peg on a floor when the crew who sat down on the sheet does an anteversion position, at this time, the augend of the load concerning the anterior part of a sheet becomes large compared with the decrement of the load concerning the back of a sheet. For this reason, before setting up greatly compared with the rate of load redoubling by the after lever, the rate of load redoubling of a lever doubles at the big rate of redoubling, and the load concerning the anterior part of a sheet is transmitted to a load detection means with it. Consequently, the large load which escaped from crew's guide peg on the floor can be amended. When the crew who sat down on the sheet does a backward-tilting position, while the load which escapes from crew's guide peg on a floor becomes small on the other hand, the decrement of the load concerning the anterior part of a sheet becomes small compared with the augend of the load concerning the back of a sheet. For this reason, the load doubled by the before lever also becomes small and the small load which escaped from crew's guide peg on the floor can be amended.
[0010]
[Embodiment of the Invention] The 1st operation gestalt of the crew weight detection equipment of this invention is explained according to drawing 1 - drawing 3 .
[0011] In addition, the drawing Nakaya mark FR shows the direction of the car front, and an arrow head UP shows the direction of the car upper part. As shown in drawing 1 , the sheet 12 is attached in the floor 10 of a car, and the sheet 12 equips it with the seat cushion 16 with which crew 14 sits down, and the seat back 18 supporting crew's 14 regions of back.
[0012] As shown in drawing 2 , between the floors 10 of a car near the front end section of the seat cushion frames 20 and 22 of right and left of a sheet 12, the front side load sensors 24 and 26 as a load detection means to detect a sheet load from the load (arrow head F1 of drawing 1) applied to the anterior part of a sheet 12 including the load applied to a seat back 18, respectively are arranged. Moreover, between the floors 10 of a car near the back end section of the seat cushion frames 20 and 22 of right and left of a sheet 12, the back side load sensors 28 and 30 as a load detection means to detect a sheet load from the load (arrow head F2 of drawing 1) applied to the back of a sheet 12 including the load applied to a seat back 18, respectively are arranged.
[0013] As shown in drawing 1 , these front side load sensors 24 and 26 and the back side load sensors 28 and 30 It connects with the load presumption circuit 32 as the amendment means constituted including the microcomputer, and a crew weight presumption means. While this load presumption circuit 32 computes the load center of gravity of a sheet 12 based on each loads F1 and F2 before and after detecting by the load sensors 24, 26, 28, and 30 and amending each loads F1 and F2 based on that calculation value Crew weight is presumed based on the amended amendment load. Moreover, the acceleration sensor 34 which detects the acceleration which acts on the cross direction of a car is connected to the load presumption circuit 32, and even if based on the acceleration G detected by the acceleration sensor 34, it amends.
[0014] Next, an operation of a **** 1 operation gestalt is explained. With the crew weight detection equipment of a **** 1 operation gestalt, in case crew's 14 weight is presumed, acceleration G is read into the load presumption circuit 32 from an acceleration sensor 34. Moreover, while reading each load into the load presumption circuit 32 from the front side load sensors 24 and 26 and computing the before side load F1 as these averages, each load is read into the load presumption circuit 32 from the back side load sensors 28 and 30, and the backside load F2 is computed as these averages.
[0015] Next, while it computes load center-of-gravity location GX=F1/(F1+F2) of a cross direction from

the side load F1 and the backside load F2 before computing the load presumption circuit 32 By change of this load center-of-gravity location GX and acceleration G, the before side load F1 and the backside load F2 are amended, sheet load F=A(F1+F2)+BGX+CG is computed, and presumed weight W1=[of crew] f (F) is computed from this sheet load F.

[0016] In addition, A, B, and C are constants, respectively and are memorized by the map of the load presumption circuit 32.

[0017] That is, when the before side load F1 and the backside load F2 are equal, it is set to load center-of-gravity location GX=1/2, and the center between the front side load sensors 24 and 26 and the back side load sensors 28 and 30 serves as a load center-of-gravity location. On the other hand, by crew's 14 anteversion position etc., in being large compared with the backside load F2, in order that a load center-of-gravity location may move [the before side load F1] to front side load sensor 24 and 26 side, the load center-of-gravity location GX is set to GX>1/2. Consequently, in sheet load F=A(F1+F2) +BGX+CG, the large load which escapes from crew's 14 guide-peg 14A to a floor 10 can be amended, and presumed weight W1=[of crew] f (F) can be computed with a sufficient precision.

[0018] Moreover, by the reliance position (backward-tilting position) to crew's 14 seat back 18 etc., in being small compared with the backside load F2, in order that a load center-of-gravity location may move [the before side load F1] to back side load sensor 28 and 30 side, the load center-of-gravity location GX is set to GX<1/2. Consequently, in sheet load F=A(F1+F2)+BGX+CG, the small load which escapes from crew's 14 guide-peg 14A to a floor 10 can be amended, and presumed weight W1= [of crew] f (F) can be computed with a sufficient precision.

[0019] Moreover, when acceleration G has occurred to the front, the recess load from crew's 14 guide-peg 14A to a floor 10 becomes small, and when Deceleration G has occurred to the front, the recess load from crew's 14 guide-peg 14A to a floor 10 becomes large.

[0020] Therefore, as shown in drawing 3 , with the **** 1 operation gestalt, the amendment alpha 1 of the load center-of-gravity location accompanying position change of crew 14 and amendment alpha 2 by change of acceleration G are carried out to the measured sheet loads F1 and F2. For this reason, the error N of crew's actual weight W and the presumed weight W1 can be made small, and crew's weight can be presumed with a sufficient precision. Moreover, components cost can be reduced for the configuration which does not need a dip sensor like the conventional technique.

[0021] Next, the 2nd operation gestalt of the crew weight detection equipment of this invention is explained according to drawing 4 - drawing 6 .

[0022] As shown in drawing 4 , the sheet 12 is attached in the floor 10 of a car, and the sheet 12 equips it with the seat cushion 16 with which crew sits down, and the seat back 18 supporting crew's regions of back.

[0023] The sheet slide rail 40 of a left Uichi pair is arranged along with the car cross direction at the sheet 12, and the sheet slide lower rail 42 order ends of each sheet slide rail 40 are being fixed to the floor 10 by holddown members, such as a bolt, respectively. The sheet slide upper rail 44 is set to these sheet slide lower rails 42 possible [a slide] to the car cross direction, respectively, and the seat cushion frames 20 and 22 of a sheet 12 are connected with the sheet slide upper rail 44. Therefore, the sheet 18 is movable to the car cross direction in one with the sheet slide upper rail 44 to the sheet slide lower rail 42.

[0024] The shaft 46 is constructed over wall section 44A set up near the front end section of the sheet slide upper rail 44 on either side. Bearing 47A formed in before [the before lever 47] side right-and-left both ends is supported to revolve pivotable by this shaft 46, respectively, and the before lever 47 is pivotable to a center of rotation in a shaft 46 to the clock hand of cut (the direction of arrow-head A of drawing 5) of drawing 5 , and the direction of a counter clockwise of drawing 5 (the direction of arrow-head B of drawing 5). Moreover, the front end section of bearing 47A of the before lever 47 is supported to revolve pivotable with the shaft 48 by the wall sections 20A and 22A formed in the front end lower part of the seat cushion frames 20 and 22. Therefore, if the anterior part of the seat cushion frames 20 and 22 is pressed below from the femoral region of the crew who sat down to the seat cushion 16 by the load which acts on the anterior part of a seat cushion 16, the before lever 47 will rotate in the

direction of a counter clockwise of drawing 5 (the direction of arrow-head B of drawing 5).
[0025] The before lever 47 is made into the shape of Y character which the front side opened by plane view, and back end section 47B has reached the abbreviation central lower part of a seat cushion 16. The load sensor 52 as a load detection means is arranged above back end section 47B of the before lever 47. This load sensor 52 is being fixed to the center-section underside of a bracket 53, and right-and-left both-ends 53A of a bracket 53 is being fixed to the sheet slide upper rail 44 on either side, respectively.
[0026] On the other hand, the shaft 54 is constructed over wall section 44B set up near the back end section of the sheet slide upper rail 44. Bearing 55A formed in backside [the after lever 55] right-and-left both ends is supported to revolve pivotable by this shaft 54, respectively, and the after lever 55 is pivotable to a center of rotation in a shaft 54 to the clock hand of cut (the direction of arrow-head C of drawing 5) of drawing 5 , and the direction of a counter clockwise of drawing 5 (the direction of arrow-head D of drawing 5). Moreover, the back end section of bearing 55A of the after lever 55 is supported to revolve pivotable with the shaft 56 by the wall sections 20B and 22B formed in the back end lower part of the seat cushion frames 20 and 22. Therefore, if the back of the seat cushion frames 20 and 22 is pressed below from the hip of the crew who sat down to the seat cushion 16 by the load which acts on the back of a seat cushion 16, the after lever 55 will rotate to the clock hand of cut (the direction of arrow-head C of drawing 5) of drawing 5 .
[0027] The after lever 55 is made into the shape of Y character which the back side opened by plane view, and front end section 55B has reached under the back end section 47B of the before lever 47. Therefore, the load sensor 52 can detect now the sum of the load of the both sides which act on back end section 47B of the before lever 47, and front end section 55B of the after lever 55.
[0028] As shown in drawing 6 (A) The distance L1 between the end points P2 of the center of rotation P1 of the before lever 47, and the seat cushion frames 20 and 22, the distance L2 between the contacting points P3 of the center of rotation P1 of the before lever 47, and the load sensor 52, the center of rotation P4 and the seat cushion frame 20 of the after lever 55, Between the distance L3 between the end points P5 of 22, and the distance L4 between the contacting points P6 of the center of rotation P4 of the after lever 55, and the before lever 47

Force measurement and evaluation for vehicle seat
Patent Assignee: BALTUS R
Inventors: BALTUS R; WOOP M

Patent Family

Patent Number	Kind	Date	Application Number	Kind	Date	Week	Type
DE 19752356	A1	19990527	DE 1052356	A	19971126	199931	B

Priority Applications (Number Kind Date): DE 1052356 A (19971126)

Patent Details

Patent	Kind	Language	Page	Main IPC	Filing Notes
DE 19752356	A1		2	G01L-001/00	

Abstract:
DE 19752356 A1

NOVELTY The method involves measuring, storing, and evaluating pressures and pressure changes, which a seated person exercises jointly with the seat on its bearing or fixture points. The seat is stored and fastened on several weighing cells, whereby the measurements of the weighing cells are individually recorded and are evaluated in a suitable calculation program, so that the intensity and the direction of the affecting forces can be determined.

USE E.g. for airbag activation in motor vehicle, or for determining number of passengers in bus or airplane (claimed).

ADVANTAGE Enables detection of direction of affecting forces.

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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the outline side elevation showing the important section of the crew weight detection equipment concerning the 1st operation gestalt of this invention.
[Drawing 2] It is the outline perspective view seen from the car slanting front which shows the important section of the crew weight detection equipment concerning the 1st operation gestalt of this invention.
[Drawing 3] It is the graph which shows the relation of the measurement sheet load of crew weight detection equipment and weight concerning the 1st operation gestalt of this invention.
[Drawing 4] It is the outline perspective view showing the important section of the crew weight detection equipment concerning the 2nd operation gestalt of this invention.
[Drawing 5] It is the outline side elevation showing the important section of the crew weight detection equipment concerning the 2nd operation gestalt of this invention.
[Drawing 6] (A) And (B) is the operation explanatory view of the crew weight detection equipment concerning the 2nd operation gestalt of this invention.
[Drawing 7] It is the outline side elevation showing the important section of the crew weight detection equipment concerning the 3rd operation gestalt of this invention.
[Drawing 8] It is the outline perspective view seen from the car slanting front which shows the important section of the crew weight detection equipment concerning the 3rd operation gestalt of this invention.
[Drawing 9] It is the amplification side elevation showing the lever section after the crew weight detection equipment concerning the 3rd operation gestalt of this invention.
[Drawing 10] It is the outline side elevation showing the important section of the crew weight detection equipment concerning the conventional operation gestalt.
[Description of Notations]
12 Sheet
16 Seat Cushion
18 Seat Back
20 Seat Cushion Frame
22 Seat Cushion Frame
24 Front Side Load Sensor (Load Detection Means)
26 Front Side Load Sensor (Load Detection Means)
28 Back Side Load Sensor (Load Detection Means)
30 Back Side Load Sensor (Load Detection Means)
32 Load Presumption Circuit (Amendment Means, Crew Weight Presumption Means)
34 Acceleration Sensor
40 Sheet Slide Rail
42 Sheet Slide Lower Rail
44 Sheet Slide Upper Rail

47 Before Lever
52 Load Sensor (Load Detection Means)
55 After Lever
66 Before Lever
74 After Lever
78 Load Sensor (Load Detection Means)
82 Connecting Rod

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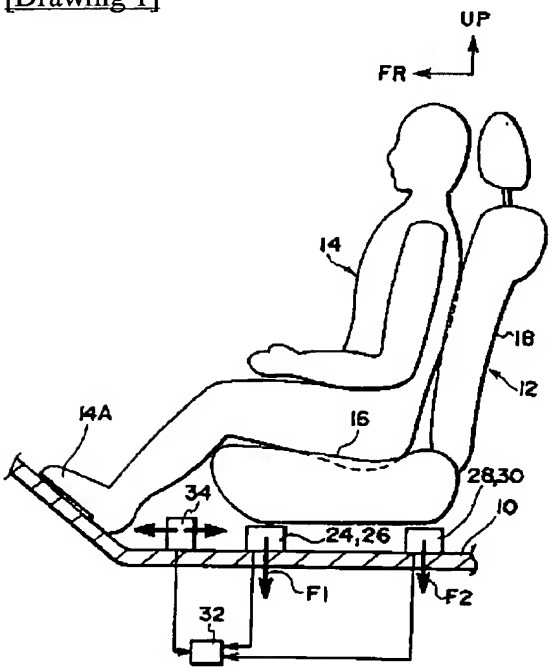
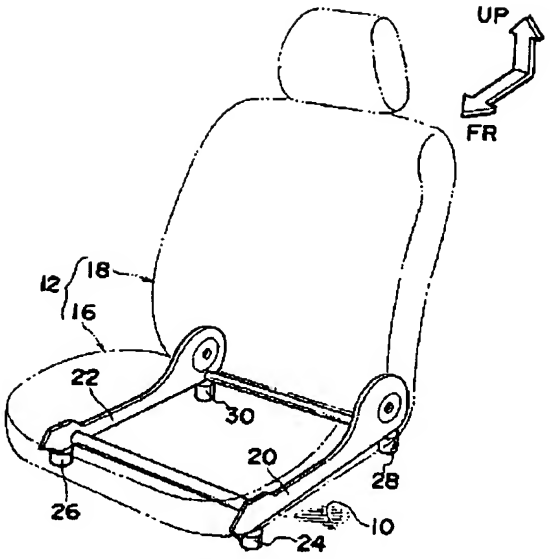
DRAWINGS

[Drawing 1]



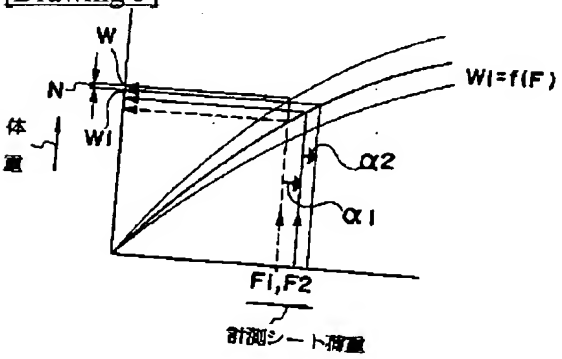
12	シート
16	シートクッション
18	シートバック
32	荷重推定回路 （補正手段、乗員体重推定手段）
34	加速度センサ

[Drawing 2]



20 シートクッションフレーム
22 シートクッションフレーム
24 前方側荷重センサ（荷重検知手段）
26 前方側荷重センサ（荷重検知手段）
28 後方側荷重センサ（荷重検知手段）
30 後方側荷重センサ（荷重検知手段）

[Drawing 3]



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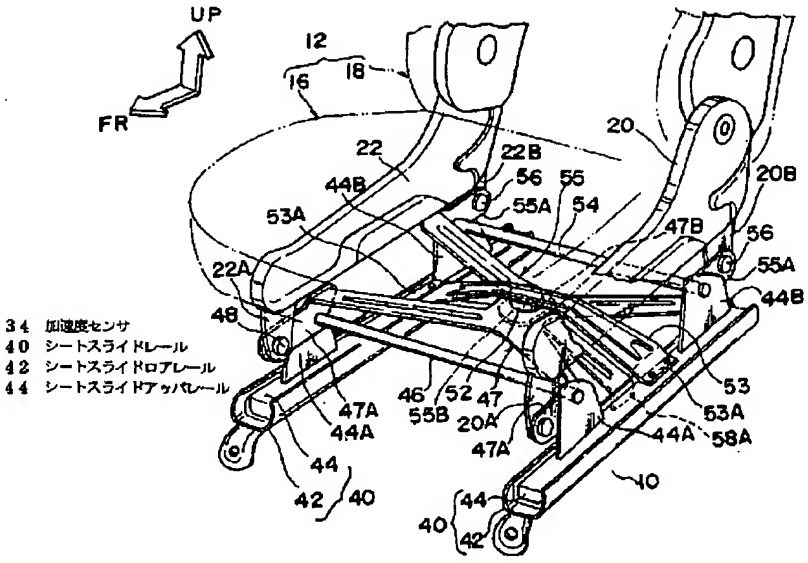

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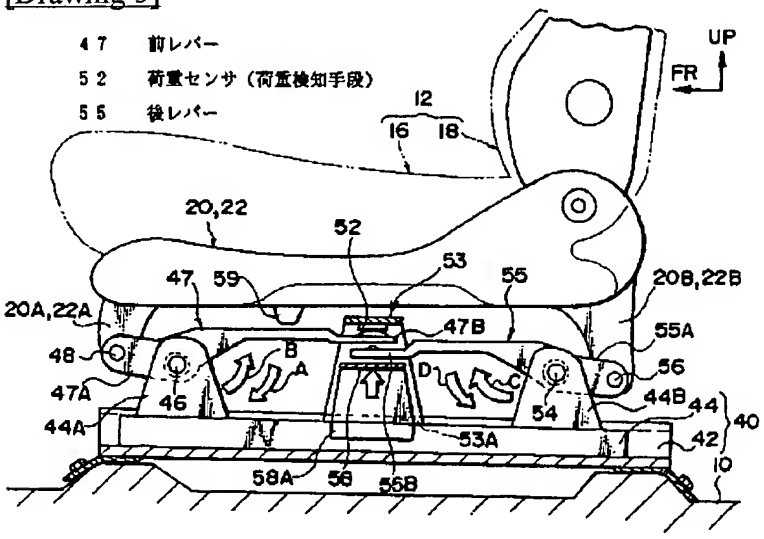
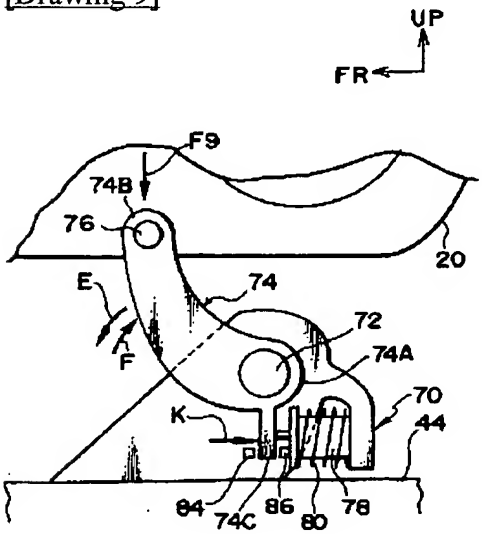


[Drawing 9]



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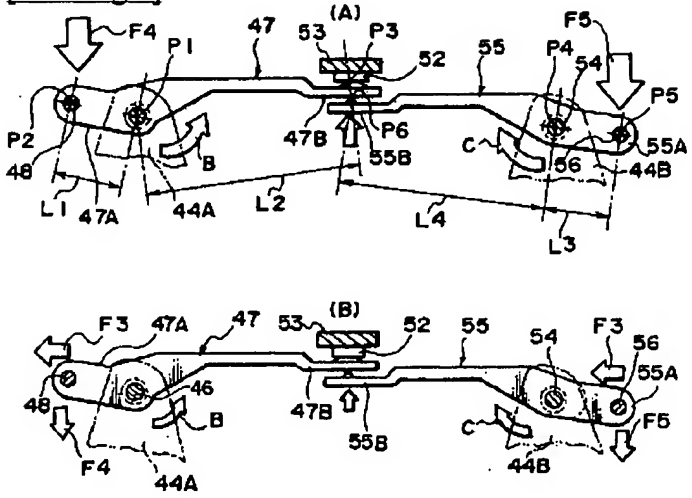

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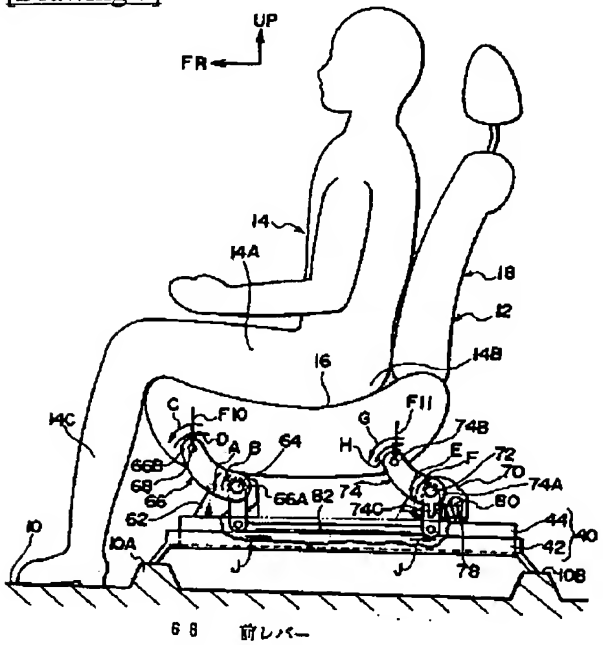
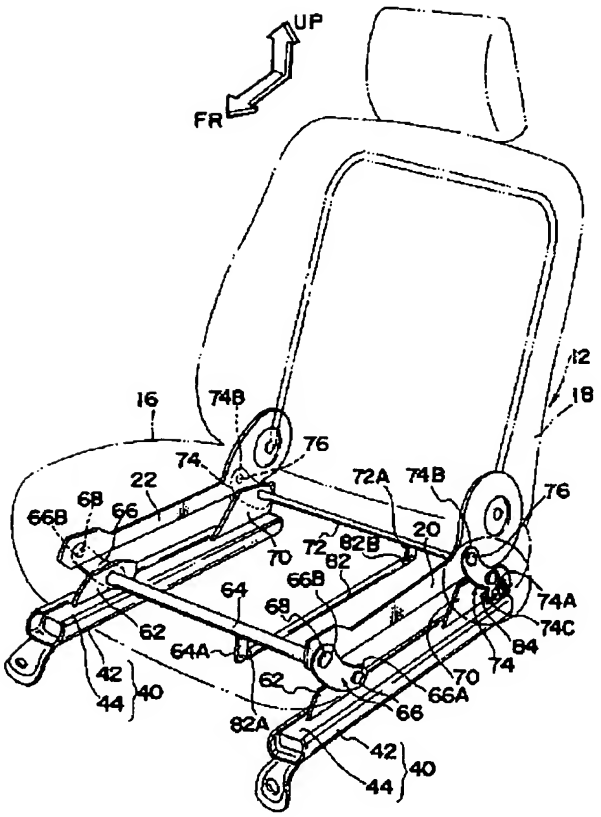
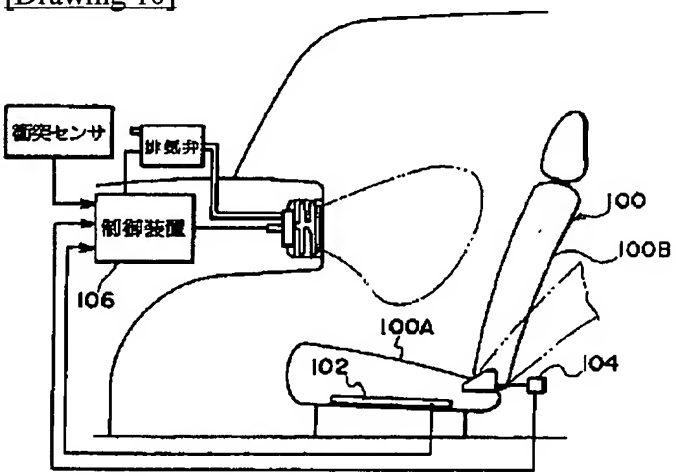


68 前レバー
74 後レバー
78 荷重センサ（荷重検知手段）
82 コネクティングロッド

[Drawing 8]



[Drawing 10]



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